

SECTION C – Descriptions and Specifications

HYDROMECHANICS OF TOWED SYSTEMS STATEMENT OF WORK

Research and Development (R&D) of towed, and marine, and other systems requires specialized instrumentation, electronics, and special purpose handling systems for experimental programs aboard high-speed towed platforms and in the laboratory environment. The Contractor shall provide the labor and materials necessary to perform the following tasks as assigned. Work to be performed shall be subject to task assignments to be issued by the Naval Surface Warfare Systems, Carderock Division (NSWCCD) in the form of delivery orders. The assignments shall define the work to be performed and shall specify the costs estimated to complete each task. Such task assignments shall be within the scope of the work set forth below:

- a. Compute the two or three dimensional configurations of a cable in a current. The analysis must incorporate state-of-the-art loading functions and account for non-homogeneous cables with various elasticities, current gradients, and speed as a function of depth, and hydrodynamic side loading.
- b. Compute the dynamic response of cable networks to transient and periodic excitation in the ocean environment using the SEADYN or other dynamic cable model. Examples include the loading on and resulting trajectory of a mooring cable during the free descent of its anchor at deployment or the trajectory of a towed body behind a towship accelerating in speed and/or direction.
- c. Compute the dynamic response of a single-leg (one and two stage) mooring and non-homogeneous multi-leg mooring for any water depth.
- d. Compute the configuration of a drifting buoy with an arbitrary number of cable elements and instruments suspended in a current profile.
- e. Compute the dynamic components displacement, velocity, acceleration, and tension of a buoy with an arbitrary number of cable segments with boundary conditions of driving force (i.e., surface follower or piercer), inertia, damping, and external restoring force subject to oscillating motions on the cable. Compute platform motion for input to model.
- f. Compute the configuration and tension distribution of the MK 103 Airborne Mechanical Minesweeping System, Depth Control Rapid Deployment Mine Sweep, A/N37U-1 Mine Clearing Set, Two-Helicopter Sweep, and similar systems with theories and computations applicable to ship systems. The analysis must account for various float, otter, depressor, and cutter conditions, as well as non-homogeneous sweep wires, and hog and sag.
- g. Compute the configuration and tension distribution of the Floating Wire Antenna System with and without the lifting buoy while accounting for non-homogeneous cables. Collect and process environmental data such as sea state (i.e., wave height and direction) and current speed and direction.
- h. Compute the response of the sweep system and the mine mooring cable during a mine engagement. The analyses will be done for airborne and shipborne mechanical sweeps, with both bare and abrasive sweepwire.

- i. Evaluate the static and dynamic response for a surface ship or submarine towed by a tug (i.e., surface or submerged). This will address both the tug, tow, and towline.
- j. Use statistical analysis to reduce hydrodynamic and/or aerodynamic data to empirical formulas with error limits for inclusion in marine system error budgets. Plot the data and fitted formulas for visual comparison.
- k. Devise and conduct experiments, analyze data, and develop hydrodynamic loading functions for various types of cables, faired towlines, and towed systems. This may include providing and/or preparing towlines, bodies, and handling equipment for experiments, sea trials, or fleet installation. Installation of bonded cable restrainer rings, special holders, and markings may also be required.
- l. Combine the results from computer models of cable systems with corresponding experimental measurements using computer plotting capability to access hydrodynamic cable forces in terms of standard empirical loading formulas or evaluate the reliability of the model results.
- m. Design, develop, and demonstrate specialized electronics and microcomputer based instrumentation for data acquisition, telemetry, control systems and special purpose test facilities and handling equipment necessary for at-sea and laboratory evaluations of cable towed, moored systems, and special marine and aviation systems projects. Telemetry systems will include voltage level, current loop, frequency shift keying, and fiber optic methodologies. The handling equipment shall be suitable for deploying, retrieving, and storing various types of cable systems for incorporating various motion compensation techniques where required. Laboratory test facilities shall include equipment's for both static and dynamic testing of models and full scale devices and equipment's in both water and wind tunnels. In the performance of this task, on-site inspection and the collection of design data may be required.
- n. Design and demonstrate the operation of various components for marine and aviation systems such as moored, towed and various ship systems. The design effort may include both the hydrodynamic design to meet the speed, depth, and other performance requirements as well as the mechanical design to provide for fabrication drawings. Examples of towed and moored components include but are not limited to: controllable depressors, autonomous vehicles, submarine communication buoys, minesweeping otters, depressors, and air maskers. Performance of this task will require, but shall not be limited to, conventional metal fabrication techniques as well as high strength reinforced laminates (employing fiberglass, graphite, and aramid fiber, etc.), aluminum and titanium welding, titanium and MP-35 machining and forming, and syntactic foam molding.
- o. Analyze, reduce, and review data for Marine & Aviation Department projects. Prepare data tables, graphs, illustrations, and text on suitable plates that could be used for reports, viewgraphs, brochures, and papers for symposia.
- p. Provide technical specifications, test plans, program plans, presentations, Design-to-Cost (DTC) estimates, design reviews, engineering drawings, engineering change proposals, technical reports, and other technical documents.
- q. Identify and resolve systems problems within the Marine & Aviation Department. This will require experience with IVDS, MK 103, AN/BSQ-5, A/N37U-1, CAM, MDR, PTB, MATSS, ISMS and AN/BRR-6 as a minimum and may require placing a team of engineers/technicians in the field and at-sea to accomplish equipment modification, rental of support ships, and providing diver support.

- r. Perform analyses of the static and hydrodynamic performance of specific fairing shapes, towed body designs, mooring suspensions, and other cable systems. These analyses will include, but not be limited to, the effects of currents, vibrations, bending, handling, and towing or suspension techniques.
- s. Provide consultation in the problem areas of marine and aviation systems and towlines, with emphasis on design analyses, handling systems, engineering materials, hydroacoustics, systems engineering, reliability, maintainability, ocean and marine engineering and naval architecture.
- t. Develop the theory and technology for attaching fittings to unconventional and non-metallic cable members containing copper and fiber optic conductors working over sheaves and winches.
- u. Provide support for project planning, management and execution of R & D of marine and aviation systems programs. Events in the development process and experimental methods must be planned, monitored, measured, and controlled in terms of a parameter common to technical disciplines involved. Within these task areas, elements can be expected to include but not be limited to numerous facets of program/project management support such as planning to establish key objectives; specifying system and subsystem tests; designate platform requirements; schedule target dates; provide alternatives and options; develop resource distributions, including manpower, materials, and facilities; plan projects; conduct meetings; design reviews; and assure adherence to performance reports and milestones.
- v. Evaluate the static and dynamic responses in various seaways of pump floats, skimmer barges, and other types of surface or subsurface recovery devices, when towed, moored, streamed or deployed from a surface craft or aircraft.
- w. Provide support in the area of Manned/Unmanned Underwater and Surface Vehicles and Subsystems (Arrays, Buoys, Towlines, Drogues, Moorings, Lateral Launch Devices, Handling Gear, Etc.). This support shall include the vehicles, vehicle support systems, control systems, subsystems and handling system design, fabrication and testing. These vehicles and subsystems may include the IVDS, VDTA, LBVDS, MK 103, AN/BSQ-5, AN/BRR-6, A/N37U-1, CAM, MDR, PTB, MATSS, LPH Launcher, PTB, TVDS, ISMS and others.
- x. Provide support focused on facility assignments, reviews, design and testing of tasks associated with emerging programs in the Marine & Aviation Department. These emerging programs include marine environmental protection, ocean energy generation systems, and other programs which relate to the general areas of hydrodynamics and hydromechanics.

KEY PERSONNEL

1. Principal Engineer - (2 resumes)

Should have a BS degree in engineering, and 15 years of experience in hydrodynamics and hydromechanics as applied to research and development of marine systems. The principal engineer should be experienced in managing projects and programs by actively participating in the planning, design, study, test, analysis and evaluation associated with the research and development of such systems. In addition, the principal engineer should have experience in planning, coordinating, and directing complex, multi-faceted programs through subordinate project managers. Experience should be shown in towed array systems, towed mine sweeping systems, towed depressor and submarine communications buoy systems, bare and faired cable handling systems, and buoy and ship moorings.

2. Senior Engineer - (3 resumes)

Should have a BS degree in engineering, and 10 years experience in hydrodynamic, hydromechanics and electronics as applied to research and development of marine systems. The senior engineer should be experienced in towed arrays systems, towed mine sweeping systems, towed depressor and submarine communications buoy systems, bare and faired cable handling systems, and buoy and ship moorings. In addition, the senior engineer should be experienced in conducting performance assessments, trade off studies and feasibility studies in at least 5 of the above areas, and experience as project manager directing other engineers and technicians in research and development activities. Experience should also be shown in theoretical and analytical aspects of R&D through development of algorithms, special analysis, computer simulation, system software and hardware-software interface.

3. Engineer – (3 resumes)

Should have a BS degree in engineering, and 8 years experience in the solution of problems and analyses associated with the research and development of marine systems. The engineer should also have specific experience in cable systems as applied to sonar, communications, and ocean engineering, as well as experience in applications orientation involving design, systems engineering, and test and evaluation. Experience should also be shown in project management to the extent of planning and leading various aspects of research and development.

4. Intermediate Engineer – (3 resumes)

Should have a BS degree in engineering, and 4 years experience in solution of problems and analyses associated with research and development of marine systems. The intermediate engineer should show specific experience in cable systems as applied to sonar, communications, and ocean engineering. In addition, the intermediate engineer should show experience in applications orientation involving design, systems engineering, test and evaluation, and project management in planning and leading various aspects of an R&D effort.

5. Engineer Scientist I – (2 resumes)

Should have a MS degree in engineering, with 20 years or more diversified experience in hydrodynamics, hydromechanics, and hydroacoustics as applied to research and development of marine systems. The engineer scientist should be experienced in design and experimental techniques associated with bare and faired towlines, high speed towed arrays, analysis of cable strumming, and design and installation of deep sea moors. In addition, the engineer scientist should be experienced in handling equipment and automatic controls for towed systems, minesweeping, and submarine communications.

6. Engineer Scientist II – (2 resumes)

Should have a BS degree, and 15 years of applicable diversified experience in hydrodynamics, hydromechanics, and hydroacoustics of marine systems. The engineer scientist II should show background emphasis on one or more physical sciences or mathematics. In addition, the engineer scientist II should show competence in the aspects of hydromechanics, hydrodynamics, or hydroacoustics of towed arrays, bare and faired towlines, high-speed towed systems, deep sea moors, and handling equipment automatic controls for towed systems. Experience should be shown in conceiving test techniques in shore facilities and at-sea trials.

NON-KEY PERSONNEL - No resumes required

1. Junior Engineer - (2 people)

Should have a degree in engineering or technical school equivalent and have 2 years experience in the solution and analyses of problems in hydrodynamics, or mechanics, or electronics associated with the research and development of marine systems. Independent and supervised work experience should include data collection, the generation of computer programs, and the analysis and design of cable systems.

2. Senior Engineering Technician - (1 person)

Should have 6 years experience or combination of technical school plus work experience totaling 4 years. Mechanical specialty with some electronics experience. The senior engineering technician should be experienced with all metal and woodworking equipment, welding both arc and heliarc, and high strength reinforced plastic laminates and syntactic foam and be capable of independent trouble shooting. In addition, the senior engineering technician should show experience in fabrication and assembly of towed and moored system components and must understand theoretical as well as practical operation. The senior engineering technician should work independently, and may direct other technicians.

3. Engineering Technician – (1 person)

Should have 4 years of experience or technical school plus work experience totaling 2 years. The engineering technician should be familiar with metal and woodworking equipment, and reinforced plastics and syntactic foam. In addition, the engineering technician can assemble and test components.

4. Systems Analyst – (1 person)

Should have a degree in business and 5-8 years experience in procurement and purchasing, contract and subcontract management, cost management/control, project scheduling, logistics analyses/support tasks. Independent and supervised work experience should include purchasing/procurement duties, supplier interface, cost and schedule management support, and review of reports and procedures.

5. Technical Writer/Editor – (1 person)

Should have a degree in a scientific discipline or equivalent years in military or on-the-job experience. Under general supervision, prepares tech manuals or reports on complex systems and research projects from raw engineering data. Schedules work effort through illustrating, composition, and printing. Must be experienced with NSWCCD report format.

6. Technical Illustrator – (1 person)

Should have 5-8 years experience or formal training and experience. Should be familiar with schematics, drawings for technical reports, all methods of visual communication and artist concepts. Should be able to translate rough sketches into presentable form for graphic presentation.

7. Drafter – (1 person)

Should be a graduate of an accredited technical institute or have completed at least 2 years of college level technical subject matter, plus possess 6-8 years of experience as a mechanical or electrical engineering designer and draftsman. Should be able to comprehend circuit drawings, schematics, and mechanical layouts assembly drawings. Emphasis in experience should be in the design of towed arrays, cable systems, high-speed towing systems, moors, diving sleds and depressors.

8. Publication Coordinator (Executive Secretary) – (1 person)

Should be a high school graduate plus a degree of typing skills and ability to coordinate assembly of large numbers of documents within the same time frame. Under general supervision types and organizes rough manuscripts into final tech manual, reports, or proposal format. Maintains, controls, and files all documents.

9. Publication Aide – (1 person)

High school graduate preferably with 1 full year study above high school level. One year appropriate experience.

10. Reproduction Equipment Operator - (1 person)

High school plus 3-4 years of closely related print shop experience. Under general supervision, operates offset reproduction equipment in preparation of printed matter. This may involve two-sided printing and use of more than one color. Should be able to operate other standard reproduction equipment such as plat makers and binding equipment.

